Summary of the Office Action

1. The drawings were objected to because they included characters not included in the reference description.

2. Claim 8 was objected to for an informality.

3. Claims 1-4, 6, 8, 13-16, and 20 stand rejected under 35 U.S.C. 102(B) as being anticipated by U.S. Patent No. 6,075,605 to Futamura et al. ("Futamura").

4. Claims 5, 7, 9-10, and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Futamura.

5. Claims 11-12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Futamura in view of Published U.S. Patent Application 2002/0140949 A1 to Sasaki et al. ("Sasaki").

Summary of the Response

Claims 1, 2, 4-6, 8, 9, 11-14, 16 and 20 have been amended.

Now pending are claims 1-20.

Replacement sheets are provided herewith.

Claim 8 has been amended to address the objection.

Please consider the following:

Detailed Remarks

Applicant requests consideration of the following remarks.

Claims 1-4, 6, 8, 13-16, and 20 stand rejected under 35 U.S.C. 102(B) as being anticipated by U.S. Patent No. 6,075,605 to Futamura

There are fundamental differences between the claimed invention and what is taught by Futamura . Claim 1 of this application recites the reference plane as corresponding to one optically generated fan beam ("optically generating at least one fan light beam"). In Futamura, this feature is absent. Futamura teaches a reference plane (L) that is only a reference plane for the light source in placing an object (M) to be measured (Page 20, lines 28-30).

Claim 1 further recites "interpreting an output of an optical imaging sensor placed in a known vertical position relative to the plane...." This is accomplished using an optical imaging sensor that has a field of view "that substantially coincides with the plane." These claimed features of claim 1 are absent from Futamura. In Futamura, a CCD camera (21) picks up the image (by pick up means 20) of the sweeping intersection of the pulsating (Page 22, lines 27-28) and rotating light beam (1) with object (M).

The language differences presented by Claim 1 and the teachings of Futamura are significant. In applicant's claimed invention, it is possible to use a camera (214) to image the intersection of the fan beam of light with the object to produce a depth or three-dimensional position information of the intersection. Only the intersection of the object with the reference plane generated from the fan-shaped light is needed. The plane generated by applicant's beam of light is a fixed plane (even though the plane may be generated using a scanning laser). In contrast, in Futamura's approach the slit (Page 20, line 44) light is a plane that sweeps an object (M). In other words, the plane of light in Futamura moves with the rotation of the polygon mirror (5). This plane of light is not the reference plane (L), or any reference. This leads to a vastly different method of detecting the shape or 3D presence of the object. In Futamura, the space-coding light source and phase-shifted operating means (Page 21, line 30) calculates the precise shape of the object (Page 21, line 35-39). Futamura's light source is turned on and off according to a stored code (Page 22, line 27-28).

In applicant's method, the much simpler geometric triangulation method is used to detect, not necessarily the shape, but the presence and 3D location of a portion of an object in a space. Given that the geometry of the light source and camera is known, the triangulation method solves the occupancy problem in much more cost effective manner. In occupancy detection of Applicant's invention, the shape recognition is unimportant.

Furthermore, the object 3D location is only needed to determine that a space is occupied or not. In applicant's method, the light source is NOT modulated (i.e. it is NOT turned on an off). The ability of Futamura's method to calculate the shape of the object depends on success of the type of visual code that is generated and detected (Page 22, lines 22-37). In applicant's method, there is no need to generate a code to detect the presence of an object.

Applicant believes that Claim 1 is allowable in its current form. Furthermore, as Claims 2-10 depend from claim 1, Applicant submits that these dependent claims are also in condition for allowance.

Applicant believes that arguments presented above apply to Independent Claim 13. The same arguments apply to claim 13 of applicant's claim. For this reason, Applicant believes Claims 13-20 are also in condition for allowance.

Claims 11-12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Futamura in view of Sasaki

With respect to Claim 11, the Examiner correctly states (in Page 7 of office action) that Futamura does not disclose use of 3D camera. However, Applicant disagrees with the Examiner's conclusion that by modifying teachings of Futamura and Sasaki, it would have been obvious to one of ordinary skill in the art to allow the device to determine the shape of intersection in a greater area. Applicant believes this conclusion is use of hindsight, and an inventive leap. To the contrary, as explained in the following paragraphs, the references teach away from such a combination or conclusion.

Sasaki's invention is tailored for high precision measurement of semiconductor circuits. Either the camera apparatus has to be placed in a moving x-y table or the camera can be fixed and the tray target is moved {Page 5, [0085]}. In either case, in order to detect 3D coordinates, the target and camera must move relative to each other. In applicant's method, the target and camera remain fixed relative to each other. As recited by Claim 1, movement is not necessary, since the step of "determining" recites interpreting an output of an optical imaging sensor placed in a known vertical position relative to the plane..." This is a significant difference that makes has significant impact on the cost and utility of the system for detecting occupancy in a space. The moving camera of Sasaki can only be used in the most limiting usage cases.

Combining the Futamura and Sasaki does not provide a solution for the occupancy detection addressed in the applicant's invention. Futamura method is too complicated, requires circuitry to modulate light, and is designed to detect shapes. Sasaki's approach is not practical, say, inside the trailer of a truck, because of the need for a moving camera (or moving target). In other words, combining these two methods will not produce a cost-effective and practical solution to the problem of occupancy detection. In applicant's invention, a single integrated method provides the fundamental data calculation to determine the size and location of occupancy in a space.

CONCLUSION

It is Applicant's belief that this Amendment places the application in condition for allowance. Applicant requests entry of the amendment and issuance of a Notice of Allowance. The Office is given permission to charge any unpaid fees to Applicants' deposit account (50-1914).

Respectfully submitted,

By

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